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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/510,744	04/22/2005	Seok-Joon Kwon	BJS-3260-27	3792
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/510,744

Applicant(s)

KWON ET AL.

Examiner

Amber D. Steele

Art Unit

1639

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on April 2 and 11, 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 57-84 is/are pending in the application.
- 4a) Of the above claim(s) 57, 62-68, 73, 78, 80 and 81 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 58-61, 69-72, 74-77, 79, and 82-84 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 10/12/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Status of the Claims

1. Claims 1-56 were canceled and new claims 57-84 were added in the preliminary amendment to the claims received on October 12, 2004.

Claims 57-84 are currently pending.

Claims 58-61, 69-72, 74-77, 79, and 82-84 are currently under consideration.

Election/Restrictions

2. Applicant's election of Group II in the reply filed on April 2, 2008 is acknowledged.

Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

3. Claims 57, 62-68, 73, and 78 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to nonelected inventions, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on April 2, 2008.

4. Applicant's election with traverse of subjecting the biocatalyst to random mutagenesis as the species of biocatalyst modification in the reply filed on April 11, 2008 is acknowledged. The traversal is on the ground(s) that a burden does not exist. This is not found persuasive because deletion of N-terminal sequence, fusing cationic peptide, site-directed mutagenesis, and random mutagenesis would all provide different structures to the biocatalyst and utilize different methods, thus, a search burden does exist.

The requirement is still deemed proper and is therefore made FINAL.

5. Claims 80-81 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on April 11, 2008.

Priority

6. The present application claims status as a 371 national stage application of PCT/KR02/00617 filed April 9, 2002.

Information Disclosure Statement

7. The information disclosure statement (IDS) submitted on October 12, 2004 is being considered, in part (see below), by the examiner.

8. The information disclosure statement filed October 12, 22004 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. A copy of Lee et al. was not received.

Specification

9. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

10. Claims 58, 59-61, 69-72, 74-77, 79, and 82-84 are objected to because of the following informalities: the claims are either dependent on claim 57 (nonelected invention of Group I; see claims 59, 69, and 74-77) or have the limitation virus (nonelected invention of Group III; see claims 58, 79, and 82-83). Appropriate correction is required.

Invention as Claimed

11. A method of bioconversion using a biocatalyst which comprises the steps of (a) transforming a host cell harboring a spore genetic carrier with a vector containing a gene encoding a biocatalyst, (b) culturing the transformed host cell and expressing the biocatalyst in the host cell, (c) allowing to form noncovalent bonds between the expressed biocatalyst and the surface of the spore so that the biocatalyst is displayed on the surface of the spore, (d) recovering the genetic carrier, and (e) detecting the biocatalyst via performing a bioconversion reaction and variations thereof.

Claim Rejections - 35 USC § 112

12. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

13. Claim 84 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. One of skill in the art would not be able to determine the scope of the presently claimed invention. For example, claim 84 states that a covalent bond is formed by a chemical method including glutaraldehyde treatment, a physical method including UV treatment, or a biochemical method including enzyme treatment. Thus, it is not clear if the glutaraldehyde

treatment, UV treatment, or enzyme treatment are claim limitations (i.e. required by the claim) or mere suggestions for potential species of treatments for the generic genus of methods.

14. Claim 74 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 74 recites the limitation "the biocatalysts" (plural) in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

15. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

16. Claims 58-61, 74-77, 79, and 82-84 are rejected under 35 U.S.C. 102(e) as being anticipated by Pan et al. WO 02/055561 (effective filing date of January 15, 2001).

The applied reference has a common assignee and inventors (Pan, Choi, and Jung) with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

For present claims 58-61, Pan et al. teach methods of bioconversion using a biocatalyst comprising (a) transformaing a host cell including *Bacillus* species harboring a spore with a vector containing a gene encoding the biocatalyst including lipase and carboxymethylcellulase, (b) culturing the transformed host cell and expressing the biocatalyst, (c) allowing noncovalent bonds to form between the expressed biocatalyst and the surface of the genetic carrier, (d) recovering the biocatalyst/spore complex, and (e) performing a bioconversion reaction (please refer to the entire specification particularly the abstract; pages 5, 8-10, 12-26, and 27-32).

For present claims 74-77, Pan et al. teach additional covalent bonds; biocatalyst exhibiting enhanced thermal, pH, organic solvent, and dry stability; spores with lower or no protease activity; and nonreproductive spores (please refer to the entire specification particularly pages 19, 24, 26, 30-32).

For present claims 79 and 82-83, Pan et al. teach modifying either the biocatalyst or the spore via (i) deleting a portion of amino acids of the biocatalyst, (ii) fusing peptide to enhance noncovalent bonding, (iii) site-directed mutagenesis, or (iv) random mutagenesis; forming covalent bonds via glutaraldehyde, UV, or enzyme treatment (please refer to the entire specification particularly pages 20, 22, 24-25, 29, 31).

Therefore, the presently claimed method is anticipated by the teachings of .

17. Claims 58-61, 69-72, 74, 79, and 82-84 are rejected under 35 U.S.C. 102(e) as being anticipated by Wang et al. U.S. Patent 7,175,983 filed November 2, 2001.

For present claims 58-61, Wang et al. teach methods of surface displaying polypeptides on spores including *Bacillus* species via (a) transforming a host cell harboring a spore (i.e.

genetic carrier) with a vector containing a gene encoding a biocatalyst, (b) culturing the transformed host cell and expressing the biocatalyst in the host cell, (c) allowing to form noncovalent bonds between the expressed biocatalyst and the surface of the spore so that the biocatalyst is displayed on the surface of the spore, (d) recovering the genetic carrier, and (e) detecting the biocatalyst via performing a bioconversion reaction (please refer to the entire specification particularly the abstract; columns 4-5, 13-14, 18, 22-23, 27-30, 33-36, 38).

For present claims 69-72, Wang et al. teach that β -galactosidase and glutathione S-transferase can be displayed on the spore surface and utilized to facilitate detection (please refer to the entire specification particularly the paragraph spanning columns 33-34).

For present claims 74, 79, and 82-84, Wang et al. teach modifying both the biocatalyst and the spore coat protein with adaptors (i.e. fusing a oligopeptide or polypeptide which enhances noncovalent bond between the biocatalyst and the surface protein of the spore) and the adaptors may also form covalent bonds (i.e. physical method; please refer to the entire specification particularly column 4, lines 61-67; column 5, lines 1-23; column 18, lines 19-56; column 22, lines 46-67; columns 23-27; column 27, lines 64-67; columns 28-29).

Therefore, the presently claimed invention is anticipated by the teachings of Wang et al.

Claim Rejections - 35 USC § 103

18. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

19. Claims 58-61, 69-72, 74-75, 79, and 82-84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. U.S. Patent 7,175,983 filed November 2, 2001 and Short et al. U.S. Patent 6,806,048 (effective filing date of June 16, 1997).

For present claims 58-61, Wang et al. teach methods of surface displaying polypeptides on spores including *Bacillus* species via (a) transforming a host cell harboring a spore (i.e. genetic carrier) with a vector containing a gene encoding a biocatalyst, (b) culturing the transformed host cell and expressing the biocatalyst in the host cell, (c) allowing to form noncovalent bonds between the expressed biocatalyst and the surface of the spore so that the biocatalyst is displayed on the surface of the spore, (d) recovering the genetic carrier, and (e) detecting the biocatalyst via performing a bioconversion reaction (please refer to the entire specification particularly the abstract; columns 4-5, 13-14, 18, 22-23, 27-30, 33-36, 38).

For present claims 69-72, Wang et al. teach that β -galactosidase and glutathione S-transferase can be displayed on the spore surface and utilized to facilitate detection (please refer to the entire specification particularly the paragraph spanning columns 33-34).

For present claims 74, 79, and 82-84, Wang et al. teach modifying both the biocatalyst and the spore coat protein with adaptors (i.e. fusing a oligopeptide or polypeptide which enhances noncovalent bond between the biocatalyst and the surface protein of the spore) and the adaptors may also form covalent bonds (i.e. physical method; please refer to the entire specification particularly column 4, lines 61-67; column 5, lines 1-23; column 18, lines 19-56; column 22, lines 46-67; columns 23-27; column 27, lines 64-67; columns 28-29).

However, Wang et al. does not teach hydrolase, oxidoreductase, lyase, isomerase, or ligase based bioconversion assays, random mutagenesis, or altered stability of the biocatalyst.

For present claims 69-72, Short et al. teach methods of identifying clones including clones with surface displayed proteins via assaying for a specified activity of interest including β -galactosidase, hydrolase, oxidoreductase, transferase, lyase, isomerase, ligase, and transglycosylation (please refer to the entire specification particularly the abstract; columns 6, 9-10, 15-16, 18, 20-24, 26-27, 32; Figures 5 and 8; Example 6; claims 1-3).

For present claim 75, Short et al. teach increased stability particularly to heat or organic solvents (please refer to the entire specification particularly column 26, lines 26-35).

For present claim 79, Short et al. teach random mutagenesis (please refer to the entire specification particularly column 26, lines 60-67; column 27, lines 13-21).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the teachings of Wang et al. with the specific polypeptides to be displayed and the mutagenesis strategy utilize in order to find polypeptides with enhanced heat or organic solvent stability.

One having ordinary skill in the art would have been motivated to do this because Short et al. teach methods to identify clones expressing polypeptides having a specific activity of interest (e.g. oxidoreductase, transferase, hydrolase, lyase, isomerase, ligase, etc. activity) wherein surface display of the polypeptides is utilized in the assay and random mutagenesis is utilized to create a diverse library including mutations that provide greater stability to heat and organic solvents (please refer to the entire specification particularly the abstract; column 6, lines 27-61; column 15, lines 26-47; column 16, lines 62-65; column 20, lines 30-36; column 26, lines 26-35 and lines 60-67; column 27, lines 13-21). In addition, Wang et al. teaches methods of utilizing adaptors to noncovalently bind polypeptides of interest to spores to provide added

flexibility for the presentation and/or selection of proteins thus avoiding drawbacks including high toxicity, limitations on orientation, instability, etc. (please refer to the entire specification particularly column 3, lines 32-67).

One of ordinary skill in the art would have had a reasonable expectation of success in the modification of the teachings of Wang et al. with the specific polypeptides to be displayed and the mutagenesis strategy utilized in order to find polypeptides with enhanced heat or organic solvent stability because of the examples provided by Short et al. (see Examples 1-6) and Wang et al. (see Examples 1-6).

Therefore, the modification of the teachings of Wang et al. with the specific polypeptides to be displayed and the mutagenesis strategy utilize din order to find polypeptides with enhanced heat or organic solvent stability render the instant claims *prima facie* obvious.

Double Patenting

20. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321© or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

21. Claims 58-61, 69-72, 74-77, 79, and 82-84 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 4, 6, 10-12, 14-19, and 28-29 of copending Application No. 10/466,208. Although the conflicting claims are not identical, they are not patentably distinct from each other because both the present invention and the invention as claimed in U.S. application 10/466,208 are drawn to making and/or using spore-displayed polypeptides via noncovalent bonds.

For present claims 58-61, U.S. application 10/466,208 claims a method for preparing a protein of interest surface-displayed on a spore via (a) transforming a host cell selected from *Bacillus* harboring a spore with a recombinant vector comprising a protein of interest including enzymes, (b) culturing the host cell to allow for spore formation, (c) allowing a noncovalent interaction to occur wherein the spore-displayed enzyme may be screened for activity via a bioconversion assays (please refer to claims 1 and 4; pages 4-5).

For present claims 69-72, U.S. application 10/466,208 claims enzymes which are further defined in the specification as glycosyltransferases, oxidoreductases, levansucrases, and hydrolases (please refer to claim 4 and pages 33, 59, and 62).

For present claims 74 and 83-84, U.S. application 10/466,208 claims additional covalent crosslinking via glutaraldehyde, UV, or enzyme treatment (please refer to claims 28-29).

For present claims 75-77, U.S. application 10/466,208 claims spores and enzymes which are further defined by the specification as being non-reproductive and lacking protease activity and being more stable to heat, pH, enzymes, etc. (please refer to claims 1 and 3; pages 18, 23-25, and 30).

For present claims 79 and 82, U.S. application 10/466,208 claims modification of the enzyme or spore via adding hydrophobic or cationic domains, deleting a portion of amino acids, fusing a peptide to enhance hydrophobic or ionic interactions, site-directed mutagenesis, or random mutagenesis (please refer to claims 11-12 and 14-16).

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Future Communications

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amber D. Steele whose telephone number is 571-272-5538. The examiner can normally be reached on Monday through Friday 9:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James (Doug) Schultz can be reached on 571-272-0763. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Amber D. Steele/

Patent Examiner, Art Unit 1639

June 11, 2008